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ABSTRACT

As part of the Army's emphasis on performance-oriented instruction in training centers, a study was conducted to determine the feasibility of using self-paced instruction in a gross motor skills course. The Crawler Tractor Operator Course, a seven-week heavy equipment course conducted at Fort Leonard Wood, Missouri was selected for the study involving approximately 300 trainees. Findings indicate that in the self-pacing system, training managers can (a) train on additional pieces of equipment, if trainees are retained for the full seven weeks; or (b) achieve substantial savings in the time and training costs if the trainees are released for assignment upon their qualification in the crawler tractor operator skills. Other findings from the self-pacing study are: (a) the system permits trainees to proceed through the course at their own rate of learning, (b) the rate of learning correlates moderately with individual predictor scores, (c) the system is readily accepted by the trainees, (d) although instructor workload is heavier, motivation and morale are higher, (e) peer instruction can be used, and (f) the system is more economical and efficient. The self-paced performance tests and questionnaires used to sample trainee and instructor attitudes toward the program are appended. (Author/AJ)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

As part of the Army's emphasis on performance-oriented instruction in Army Training Centers, a study was conducted to determine the feasibility of using self-paced instruction in a gross motor skills course. The Crawler Tractor Operator Course, MOS 62E20, a seven-week heavy equipment course conducted at the U.S. Army Training Center, Engineer, Fort Leonard Wood, Missouri, was selected for the study, which involved approximately

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300 trainees in Mental Categories I through IV. Findings indicate that in the self-pacing system, training managers can (a) train on additional pieces of equipment, if trainees are retained for the full seven weeks; or (b) achieve substantial savings in time and training costs if the trainees are released for assignment upon their qualification in the Crawler Tractor operator skills. Other findings from the self-pacing study are: (a) the system permits trainees to proceed through the course at their own rate of learning; (b) rate of learning correlates moderately with individual predictor scores; (c) the system is readily accepted by the trainees; (d) although instructor workload is heavier, their motivation and morale are higher than under a conventional system; (e) peer instruction can be used and its value is recognized by the instructors; and (f) logistically, the self-pacing system is more economical and efficient.

SUMMARY AND CONCLUSIONS

PURPOSE

A research effort was conducted to determine the feasibility of using self-paced instruction in a gross motor skills course and to develop course organization procedures and effective instructional techniques for the conduct of self-paced training.

APPROACH

The Crawler Tractor Operator Course, MOS 62E20, a seven-week, heavy equipment course conducted at the U.S. Army Training Center, Engineer, Fort Leonard Wood, Missouri, was selected for the study. The first phase, Self-Paced I, was a partially self-paced program which permitted trainees to advance to other types of engineer heavy equipment if they could qualify on the Crawler Tractor operation at the end of the third, fourth, or fifth weeks of training. An operations test was administered on an end-of-week basis only.

The second phase, Self-Paced II, was a more completely self-paced program which permitted the trainee to qualify in each of 10 Crawler Tractor performance tests whenever he was ready. The tests were administered at any time during a given week. For the remaining course time available, the trainee was given the options of remaining as a peer instructor in the Crawler Tractor Course, moving on to receive additional instruction on other equipment, or combining these activities.

Performance and attitude data were collected on approximately 300 trainees of the Armed Forces Qualification Test (AFQT) Mental Categories I through IV. Cadre attitude instruments were administered at intervals during the Self-Paced I and Self-Paced II programs.

FINDINGS

Self-Paced I and Self-Paced II Performance

Crawler Tractor performance test results for seven classes (an input of 152) under a "refined" Self-Paced I concept were as follows:

	3d Week	4th Week	5th Week	7th Week	Total
Number of trainees completing tests	38	38	45	17	138
Percent completing tests	25%	25%	30%	11%	91%

Test results for seven classes (an input of 158) under the more complete Self-Paced II concept were as follows:

	3d Week	4th Week	5th Week	7th Week	Total
Number of trainees completing tests	30	40	49	24	143
Percent completing tests	19%	25%	31%	15%	90%

Correlation of Performance With Predictor Scores

Correlation coefficients were calculated between performance scores and scores on selected tests from the aptitude batteries administered upon entrance into the Army; the AFQT, the Skilled Technical (ST), and the Motor Maintenance (MM) scores. For the Self-Paced I classes there was a weak correlation between Mean Days to Proficiency and the MM scores, and no correlation with the AFQT and ST scores. For the Self-Paced II classes there were moderate correlations between Mean Days to Proficiency and the AFQT, ST, and MM scores.

Performance of Category IV Trainees

In the Self-Paced I program, Mean Days to Proficiency was the same for all mental categories. Under the Self-Paced II program Mean Days to Proficiency scores were higher for Category IV trainees, indicating that they required more time than did the non-Category IV trainees.

Additional Skills

Of a total of 281 trainees, 47, or 17%, moved on and learned to operate two additional types of heavy engineer equipment; 177, or 63%, learned to operate one additional type; and 57, or 20%, learned only the one skill of operating the Crawler Tractor.

Attitudes of Trainees and Cadre

The trainee attitude data showed a positive acceptance of self-paced instruction. They considered their proficiency tests to be valid and related to the job of operating a Crawler Tractor. They felt they were permitted to proceed through the course at their own rate. Their motivation and morale were much higher under self-pacing than under the conventional methods of instruction.

Although the cadre did not readily accept the self-paced system initially, attitude data collected at intervals eventually showed their motivation and morale to be higher than under conventional methods. Peer instruction took time for recognition and understanding; but after it produced results, it too was favorably accepted by the cadre. As the cadre came to accept self-pacing and peer instruction, they viewed this system of instruction to be effective and efficient.

Resources

Fuel consumption was more efficient under self-pacing, in that equipment operation time was related to the individual's actual time required to reach proficiency. With an overall reduction of individual training time in the Crawler Tractor Course, fuel consumption in the course was accordingly reduced.

Where formerly two 100-man classrooms were required, the self-paced program reduced needs to only one classroom for three and one-half days per cycle.

The entire study was supported with no increase in the assigned instructor cadre.

CONCLUSIONS

(1) Self-pacing works well. This performance-based system of learning applied to a motor skills course is both feasible and practical. The system is accepted by both trainees and cadre. The system permits more efficient utilization of time, facility, and personnel resources.

(2) Self-pacing provides the option of achieving higher proficiency. Some trainees are able to acquire two additional sets of equipment operator skills. Substantial numbers of trainees are able to acquire one additional set of skills during the time conventionally devoted to learning only one set of skills.

(3) Self-pacing provides the option of making substantial savings of time in the training base and accelerating the assignment of trained individuals to operational units. Projected dollar savings for a 1000-trainee input to a self-paced Crawler Tractor Course exceeded a half million dollars.

PREFACE

HumRRO Work Unit ATC-PERFORM was initiated in 1972 to assist the Army in a continuing review, evaluation, refinement, and implementation of performance-based training at training centers. As part of ATC-PERFORM, a study was conducted to determine the feasibility of self-pacing a motor skill course. The Crawler Tractor Operator Course, MOS 62E20, was selected for this study. Work was accomplished at the U.S. Army Training Center, Engineer, at Fort Leonard Wood, Missouri, from September 1973 through August 1974.

Work Unit ATC-PERFORM has been conducted by HumRRO Western Division at the Presidio of Monterey, California, with Dr. Howard H. McFann as Director. Dr. John E. Taylor was the Work Unit Leader. This self-pacing study was conducted by Mark F. Brennan with John T. McGiveran assisting in the analysis of data.

Administrative and logistical support for the study was provided by the U.S. Army Research Institute Field Unit, Presidio of Monterey, whose chief is COL Ullrich Hermann.

HumRRO research on ATC-PERFORM was conducted under Contract DAHC19-73-C-0004, under the sponsorship of the U.S. Army Research Institute for the Behavioral and Social Sciences, with Dr. Otto Kahn serving as the technical monitor. Training research is conducted under Army Project 2Q062107A745.

Meredith P. Crawford
President
Human Resources Research Organization

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This experiment would not have been successful without the cooperation of representatives of both the U.S. Army Training Center (USATC), Engineer, at Fort Leonard Wood, Missouri, and the U.S. Army Engineer School at Fort Belvoir, Virginia.

The efforts and dedication of several officers of the USATC, Fort Leonard Wood, deserve special mention. COL Maurice D. Roush and MAJ Harvey S. Bartlett II of the 4th AIT Brigade; LTC Robert E. Conroy and MAJ Harry C. Lewis of the 4th Bn, 4th Brigade; and 1LT Daniel G. McNicholl of B Co., 4th Bn, 4th Brigade, were instrumental in the detailed planning and operation of the research effort.

MAJ Lonnie Williams of the U.S. Army Engineer School, Fort Belvoir, Virginia, assisted in selection of the course for study, and the review of course content and performance tests.

The contribution of these individuals to the self-pacing study was of major proportion.

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Self-Pacing a Gross Motor Skills Course: Crawler Tractor Operator, MOS 62E20

INTRODUCTION AND OVERVIEW

The research described in this report was a subeffort of Work Unit ATC-PERFORM, a three-year project which had as its objective providing assistance to the Army in the review, evaluation, and refinement of performance-based training in Basic Combat Training and Advanced Individual Training, both combat and combat-support programs.[1] The sponsor was the U.S. Army Training and Doctrine Command (TRADOC).

In January 1973, Headquarters TRADOC (then U.S. Continental Army Command) distributed a directive, "Self-Paced Instruction in AIT," which asked all Army schools to review and analyze which of their Army Training Center (ATC) courses were adaptable to self-pacing. Based on this letter, the U.S. Army Engineer School at Fort Belvoir, Virginia, asked assistance of HumRRO in analyzing the AIT courses, and briefing on the concepts of self-pacing, at Fort Leonard Wood, Missouri, the Engineer Training Center.

During the period 14-17 May 1973, representatives from the Engineer School and HumRRO visited Fort Leonard Wood and accomplished the analyses and briefings. It was determined that it was feasible to introduce self-pacing, in whole or in part, to a number of the courses. The general concept of self-pacing to be employed had been previously derived from the findings of earlier studies by HumRRO under Work Units APSTRAT[2] and OFFICE-ED.[3] The Crawler Tractor Operator Course (MOS 62E20) was one of two courses tentatively selected for self-pacing and nominated to serve later as a model for the conversion of other skill and operator courses.

Following discussions with HumRRO personnel on the concepts of performance-oriented training and on the self-pacing concepts to be studied, the 4th AIT Brigade (Engineer) at Fort Leonard Wood immediately developed and fielded its "Incentive" program for the Crawler Tractor Operator Course. This initial self-pacing concept, disignated in this report as the Self-Paced I program, was developed largely by Fort Leonard Wood personnel with only limited guidance by HumRRO. This program provided for proficiency testing of trainees at the end of the third, fifth, and seventh weeks of training. Depending upon how quickly a trainee passed all Crawler Tractor tests, he was advanced to training on additional pieces of equipment (Scooploader and/or Wheeled Tractor). This "Incentive" program (Self-Paced I) continued at Fort Leonard Wood until the Self-Paced II program was instituted, as described in later sections.

In November 1973, Headquarters TRADOC formally designated the Crawler Tractor Operator Course at Fort Leonard Wood, Missouri and the Supplyman Course at Fort Ord, California for self-pacing experimentation to commence during the third quarter

[1] See *Establishing the Concepts and Techniques of Performance-Oriented Training in Army Training Centers: A Summary Report*, by John E. Taylor and Staff, ATC-PERFORM, HumRRO Technical Report 75-21, June 1975, for an omnibus report of the activities and accomplishments of the overall ATC-PERFORM project.

[2] Kenneth Weingarten, Jacklyn E. Hungerland, and Mark F. Brennan. *Development and Implementation of a Quality-Assured, Peer-Instructional Model*, HumRRO Technical Report 72-35, November 1972.

[3] Jacklyn E. Hungerland, Eugene R. Michaels, and John E. Taylor. *Development and Pilot Test of a Career-Oriented, Peer-Instructional Model in the Office Cluster of Business Occupations*, HumRRO Technical Report 72-28, October 1972.

FY 1974.[1] The selection of these courses provided study of diverse types of skills—from heavy equipment operation to application of clerical and mathematical skills. In each study, the USATC responsibility was primarily to provide support, while proponent school responsibility was oriented toward specifying course content. HumRRO was responsible for instructional technology, organization for training, experimental design, analysis of data, and report writing. The goals of the separate studies were to determine the optimum course organization and the most effective instructional techniques for the conduct of self-paced training.

At that time, representatives of the Engineer School, Fort Leonard Wood, and HumRRO re-examined the Incentive program for Crawler Tractor trainees since refinements had been made as the result of field experience: The weekly proficiency test schedule had been modified, and another piece of equipment (Motor Grader) had been included for additional skill training for early graduates.

In January 1974, HumRRO, Engineer School, and Fort Leonard Wood representatives planned in detail the concepts to be employed in the Self-Paced II program. A data collection plan, which called for comparing approximately 150 trainees from the Incentive or Self-Paced I program with a like number from the Self-Paced II program, was agreed upon and placed in effect. It included basic information about each trainee, test scores made on entry into the service, and progress in skill proficiency while in the course. Also, a plan for collecting student and cadre attitude data was placed in effect.

In February and March 1974, lesson plans, course texts, and the existing Army Subject Schedule (ASubjScd) were reviewed and performance tests were drafted, all in close coordination among representatives of HumRRO, the Crawler Tractor Operator Course, and the Engineer School. The proficiency tests in Army Subject Schedule 5-62E20 were revised in light of what was actually used by the instructors to evaluate the trainees. Test situations and test conditions were clarified, minor revisions made in content, and a refined series of performance tests constructed. After initial drafts were tested for feasibility, the final tests were approved by the Engineer School. (These tests were also packaged as a student handout. See Appendix A.) Data collection began.

In April 1974, just before the first class was scheduled to begin Self-Paced II, HumRRO undertook instructor indoctrination and administration of the initial cadre survey. A system was developed whereby instructors could keep records on each individual's progress as well as on the dates of their tests and results, and utilize flexible scheduling to achieve individual self-pacing.

[1] See *Self-Paced Instruction in a Cognitively Oriented Skills Course: Supplyman, MOS 76Y10*, by Jacklyn E. Hungerland and John E. Taylor, HumRRO Technical Report 75-20, June 1975, for the findings of the study to self-pace the Supplyman Course conducted at Fort Ord.

APPROACH

DEVELOPMENT AND TEST OF THE INCENTIVE (SELF-PACED I) PROGRAM

Description of Self-Paced I Program

Early in September 1973, the 4th AIT Brigade (Engineer) at Fort Leonard Wood proposed a test program to TRADOC to provide greater incentive and improve morale of trainees in the Crawler Tractor Operator Course (MOS 62E20). The initial Self-Paced I concept provided for proficiency testing of trainees at the end of the third, fifth, and seventh weeks. Trainees who passed all tests at the end of the third and fifth weeks were advanced to training in operating other heavy engineer equipment.

After a number of trainee classes were run through the program, a modified test concept was adopted which made the third-week test voluntary on the part of the trainee and introduced a fourth-week test. Mandatory test periods then came to be required at the end of the fourth, fifth, and seventh weeks. This modified Self-Paced I concept was in effect at the time HumRRO initiated planning for the Self-Paced II phase. Figure 1 is a schematic of the self-paced concept showing the weekly tests for Crawler Tractor and the additional training options.

The Self-Paced I concept was a major departure from the conventional group-paced lockstep method of instruction. The program was designed to give an incentive to the soldier to learn a number of skills he would have to use while on the job in his unit. Formal classroom periods were eliminated and all instruction was moved to the field. Instructor verbal presentation periods were minimized, and trainee practice time on the equipment was maximized. All proficiency tests were scored on the basis of demonstrated proficiency in the actual skills. The concept accommodated previous skill learning and the fact that individuals learn at different rates, aspects which have not been included in conventional group-paced programs.

Under the conventional program, prescribed in Army Subject Schedule 5-62E20, all trainees received seven weeks of Crawler Tractor Operator training, notwithstanding differences in aptitude for learning or the fact that many trainees probably had learned some of the skills in civilian life. All proficiency tests were scheduled at end-of-course, even though many trainees probably could have met proficiency standards well before that time.

Administration and Data Collection

Performance tests (using guidelines established in Appendix F of Army Subject Schedule 5-61E20) were administered on a weekly basis as previously described. The particularly capable trainees, especially those with prior equipment-operating experience who could demonstrate that they could meet entry-level performance objectives in three weeks, were then advanced to the Scooploader Course and eventually the Wheeled Tractor Course for additional skill training.

A fourth-week test was administered to all remaining trainees; those who passed were advanced into the Motor Grader/Wheeled Tractor Courses. Again, at the end of the fifth week, the tests were administered and those who passed were moved into the Wheeled Tractor Course. Those who did not pass the tests by the end of the fifth week

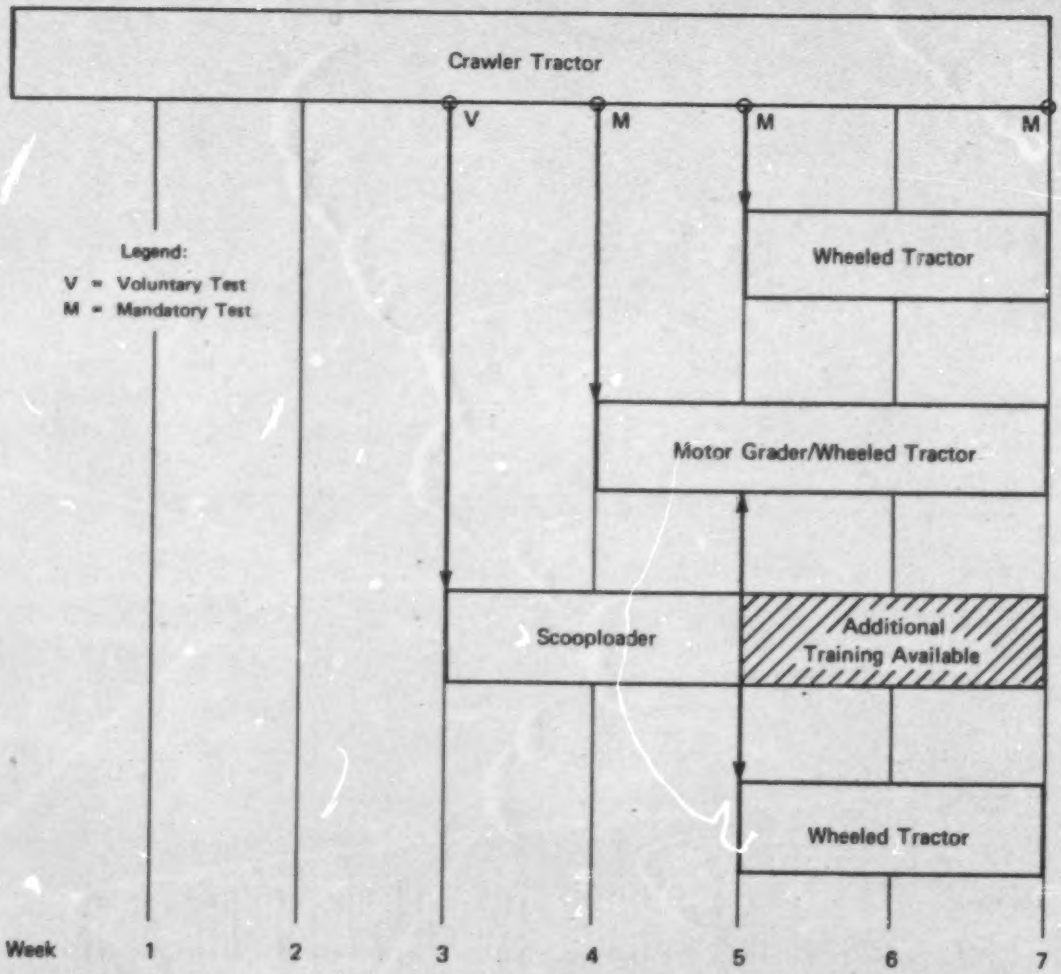

Figure 1. **A Schematic of Self-Paced Concept**

remained in the Crawler Tractor Operator Course and were required to pass the performance tests in order to graduate from the course.

Data collection was initially limited to information on the number of trainees finishing by the end of the third, fifth, and seventh weeks. Trainee attitudes were assessed initially by using an informal instrument, developed previously by Fort Leonard Wood personnel, and administered routinely upon course completion. Information was gathered from a group of 80 trainees who had completed the conventional program, and from a group of 390 who had completed the initial Self-Paced I program. As mentioned earlier, in January 1974 a more comprehensive data collection plan on trainee performance was initiated with the Self-Paced I classes to be used as a basis for comparison with the Self-Paced II system to be implemented later. A more comprehensive attitude instrument was also initiated so that the attitudes of graduates of the refined Self-Paced I and Self-Paced II programs toward specific training techniques (e.g., performance tests, use of self-pacing, use of peer instruction) could be assessed. Responses were obtained from 138 Self-Paced I and 143 Self-Paced II graduates.

Cadre attitudes were sampled by administering a short questionnaire after Self-Paced I had been in operation approximately five months. Attitude questionnaires were administered solely to supplement the other information being gathered, and to indicate where problems were occurring. Attitude development and assessment were not being studied in the formal sense.[1]

DEVELOPMENT AND TEST OF THE SELF-PACED II PROGRAM

Description of Self-Paced II Program

While Self-Paced I accomplished a major step in departing from the conventional lockstep system of instruction, it still required adherence to a weekly schedule, with proficiency tests given on a fixed basis at the end of each week. The Self-Paced II concept was designed to accommodate even more to the individual learning rates of the trainees than Self-Paced I. Under Self-Paced II, trainees were issued copies of all 10 performance tests as a study aid and were encouraged to take the tests whenever they felt they were ready. Further, upon passing all the tests, they were given the options of staying with the course to assist with the instruction of their slower-learning peers or moving on to learn to operate additional pieces of equipment.

The Self-Paced II concept built upon, and made full use of, the Incentive program in effect in Self-Paced I. Operationally, Self-Paced II was a system that permitted the trainees to learn the skills at their own rate within reasonable administrative constraints. The system allowed the soldier to practice skills as much or as little as he needed; that is, he was permitted to go quickly through a particular sequence if he felt confident, or he was permitted to take more time and ask for help if he needed it. The soldier who, in practice, demonstrated his proficiency in a skill, was allowed to undergo a test by the noncommissioned officer (NCO) instructor, and was not held back for repeated practice. Slower learners were given every opportunity to practice and become confident in learning to operate the equipment and were not forced to undergo tests until they were ready to do so. Often the slower learner was brought to the required level of proficiency by receiving individual help from an NCO instructor or another student who had already been checked out (i.e., a peer instructor).

Administration and Data Collection

The program provided for inprocessing and outprocessing time and a daily allocation of training time for prescribed subjects. All training specific to Crawler Tractor operation was self-paced. The trainee first entered a Basic Skill Acquisition module, where he acquired and practiced basic skills on the Crawler Tractor. As each trainee reached proficiency in his newly acquired basic skills, he was permitted to take the relevant performance tests on his own, without coaching.

When he demonstrated that he had become proficient in the basic skills, the trainee moved into an Operation and Maintenance Skill Acquisition module. Instruction in operation and maintenance skills was conducted in a functional setting, that is, maintenance practice was performed daily at the beginning and end of the practice in operation of the equipment or at prescribed intervals when periodic maintenance was indicated. As a trainee demonstrated proficiency in each operational and maintenance area, he was given the relevant performance tests by the instructor.

[1] Questionnaires used to sample trainee and instructor attitudes toward the self-paced programs are contained in Appendix B.

After he had passed all tests, the trainee was permitted to advance to additional skill training, or to volunteer to remain in the Crawler Tractor Operator Course as a peer instructor. Additional skill training choices were General Construction Machine, Motor Grader, Wheeled Tractor, Scooploader, and Crane Shovel operation.

As mentioned earlier, a data collection plan was designed to obtain information on the performance of approximately 150 trainees in the Self-Paced I program and 150 in the Self-Paced II program. Since the Self-Paced I program had already replaced the conventional program, it was not possible to obtain baseline data on the performance of trainees undergoing the conventional instruction prescribed in the Army Subject Schedule. The data collection plan also provided for collecting trainee demographic information, aptitude test scores on entry into the service, and trainee progress records while in the course.

Attitude questionnaires were administered to both trainees and cadre. Trainee graduates received the same comprehensive instrument that had been administered to graduates of the refined Self-Paced I program. Cadre attitudes were sampled twice over a two-month time period to assess any changes in their comparisons of Self-Paced II with Self-Paced I.

FINDINGS

SELF-PACED I PROGRAM

Performance of Trainees

The initial Self-Paced I concept, designed to increase motivation of those who had previous operator skills or were fast learners, provided for mandatory performance testing at the end of the third, fifth, and seventh weeks. Those trainees who passed the tests were entered in other equipment operator courses for additional skill learning.

Performance test results for seven classes (an input of 219), conducted under this program September through December 1973,[1] were as follows:

	3d Week	5th Week	7th Week	Total
Number of trainees completing tests	22	124	68	214
Percent completing tests	10%	57%	31%	98%

Refinement of the initial program provided for voluntary testing of trainees at the end of the third week, and mandatory testing at the end of the fourth, fifth, and seventh weeks of training.

Performance test results for seven classes (an input of 152) under the Refined Self-Paced I program, January through April 1974, were as follows:

	3d Week	4th Week	5th Week	7th Week	Total
Number of trainees completing tests	38	38	45	17	138
Percent completing tests	25%	25%	30%	11%	91%

Those trainees who mastered the proficiency tests in fewer weeks than the prescribed seven weeks were given additional skill training in other equipment operator courses. Of the total of 138, 17, or 12%, acquired the one skill of Crawler Tractor Operator; 95, or 69%, acquired two skills; and 26, or 19%, acquired three skills.

Trainee Attitudes

Attitude assessment, using the responses to the informal Fort Leonard Wood instrument, indicated that the trainees who participated in the self-pacing program had more positive reactions to their training than did the conventionally trained group. Comparison of the groups' responses indicated that trainees under self-pacing were more motivated to pursue instruction, and had higher morale.

[1] Data obtained from Fort Leonard Wood letter, "Crawler Tractor Self-Paced Training Report (Interim)," ATZT-DPT-TT, 10 March 1974.

Responses on the more comprehensive survey, which assessed attitudes toward specific aspects of instruction, showed consistently positive reactions toward the self-pacing approach.

Cadre Attitudes

In the initial survey, in which instructors had been asked questions comparing the Self-Paced I program with the conventional program, the responses were somewhat favorable to the Self-Paced I program, but not uniformly so. They reported their own motivation and morale to be higher under self-pacing, but also said that self-pacing required them to work harder. They also indicated that time was used inefficiently under self-pacing. They appeared to be reluctant to depart from the familiar conventional system.

Responses to questions comparing the proficiency of course graduates were uniformly in favor of the self-pacing approach.

SELF-PACED II PROGRAM

Performance of Trainees

As mentioned earlier, under this program individuals were tested for proficiency as they mastered the successive skill modules. Tests were administered on an individual basis and not on a fixed weekly schedule.

Performance test results for seven classes (an input of 158) conducted under the program, April through July 1974, were as follows:

	[illegible]	4th Week	5th Week	7th Week	Total
Number of trainees completing tests	30	40	49	24	143
Percent completing tests	19%	25%	31%	15%	90%

Again, those trainees who mastered the proficiency tests in fewer than the prescribed seven weeks were given the option of volunteering as peer instructors in the Crawler Tractor Operator Course or going on to other equipment courses. Many did both. Of the 143 trainees who completed the Self-Paced II program, 40, or 28%, acquired the basic skill of Crawler Tractor Operator, and of these same 40, 29 served as peer instructors; 82 trainees, or 57%, acquired two skills, and of these, 35 served as peer instructors; 21 trainees, or 15%, acquired three skills, and of these only one served as a peer instructor.

Trainee Attitudes

Responses of the seven classes in the Self-Paced II program were compared with the seven classes who had completed Self-Paced I instruction. In general, the graduates' attitudes about the relevance of training to job performance, difficulty of performance tests, self-pacing of the course, and peer instruction were strongly positive for both programs. The groups did not differ significantly.

Cadre Attitudes

Responses to the two surveys comparing Self-Paced II and Self-Paced I (the first survey administered seven weeks after Self-Paced II was introduced, and the second

survey nine weeks later) indicated that initially cadre personnel felt they had to work even harder under Self-Paced II. After the program had run for several cycles, their opinions shifted to indicate that Self-Paced II required about the same workload as the Self-Paced I program.

Also, they indicated initially that time was wasted in the Self-Paced II program. The "institutional change" in instructional methods and administrative procedures, many of which were required in the Self-Paced II program, took time for acceptance by the cadre. With experience, their opinions shifted to indicate they found the program to be an efficient one.

Responses to questions comparing the proficiency of course graduates were identical to the responses they gave in the Self-Paced I survey. In both instances, they were positive about student proficiency.

There was a shift in the second Self-Paced II survey reflecting the cadre's opinion of the value of peer instruction. At first cadre personnel were negative toward the concept and were reluctant to use graduates to assist slower learners in their skill practice. The high ratings given to peer instruction by the cadre in the later survey indicate its acceptance and their recognition of its value.

CORRELATIONS BETWEEN APTITUDE MEASURES AND TIME TO PROFICIENCY UNDER THE SELF-PACED I AND SELF-PACED II PROGRAMS

At the time this study of self-pacing was being performed, candidates for heavy equipment operator courses were not being selected on the basis of AFQT, ST, or MM scores. Accordingly, course inputs to the study were not being restricted to a particular range of these scores.

Product-moment correlations were calculated to determine the degree of relationship between these scores and time spent in the course. Under the Self-Paced I program, AFQT and ST correlations with Mean Days to Proficiency were nonsignificant at the .05 level. The MM score correlated with Mean Days to Proficiency at the .05 level. Under the Self-Paced II program, AFQT, ST, and MM correlated with Mean Days to Proficiency. These correlations were significant beyond the .05 level. As expected, all correlation coefficients were negative.

Table 1 shows the correlation of Mean Days to Proficiency with AFQT, ST, and MM scores for both programs.

PERFORMANCE OF CATEGORY IV TRAINEES

In light of the correlation coefficients reported in Table 1, Mean Days to Proficiency scores were calculated for the I and II (high), III (medium), and IV (low) mental categories for both the Self-Paced I and Self-Paced II groups. As shown in Table 2, Mean Days to Proficiency scores did not differ across the three categories under Self-Paced I. Under Self-Paced II, Category IV trainees spent approximately four more days in training than did the non-Category IV trainees. Statistical tests of the difference between Category IV and non-Category IV scores showed that Category IVs did differ significantly from all other groups at the .02 level or beyond. This analysis is summarized in Table 3.

Table 1

Correlation Between Aptitude Measures and Time to Proficiency Under Self-Paced I and Self-Paced II Programs

	Self-Paced I		Self-Paced II	
Number of Classes	7		7	
Number of Trainees	138		143	
Mean Days to Proficiency	20.7		21.7	
Correlation Between Test Scores and Mean Days to Proficiency				
	r	Sig	*r*	Sig
Armed Forces Qualification Test (AFQT)	−.10	NS	−.24	< .05
Skilled Technical (ST)	−.14	NS	−.36	< .05
Motor Maintenance (MM)	−.16	.05	−.37	< .05

r = product-moment correlation coefficient

Sig = significance level. One-tailed tests of significance were used in that these correlations were expected to be negative.

Table 2

Mean Days to Proficiency Scores, by Mental Categories

	Self-Paced I			Self-Paced II		
	CAT I & II	CAT III	CAT IV	CAT I & II	CAT III	CAT IV
Mean Days to Proficiency	19.7	20.8	20.5	20.6	20.9	24.5
Number of Trainees[a]	28	66	17	25	71	28

[a]Data for only those trainees with reliable AFQT scores were included here.

Table 3

Mean Difference Tests of Mental Category IV Performance vs Other Mental Categories: Self-Paced II Data

	CAT I & II	CAT III	CAT IV	CAT I, II, & III
Mean Days to Proficiency	20.6	20.9	24.5	20.8
Number of Trainees	25	71	28	96
Standard Deviation	5.79	5.51	5.50	5.56

Group Comparisons	*t*	Significance Level[a] (two-tailed)
I & II vs IV	2.49	< .01
III vs IV	2.90	< .01
I, II, & III vs IV	3.07	< .01

[a]One-tailed tests of significance were used in that Category IV trainees could be expected to require more training time.

ADDITIONAL SKILLS DATA

In Self-Paced I, those trainees who mastered the Crawler Tractor proficiency tests ahead of the prescribed seven weeks were given additional skill training in other equipment operator courses. They were not provided the opportunity to serve as peer instructors. In Self-Paced II, the faster learners were given the options of volunteering as peer instructors in the Crawler Tractor Course and/or going on to other equipment courses. Many did both.

Table 4 summarizes results of the Self-Paced I and Self-Paced II programs for total number of skills acquired by trainees. The data indicate that 20% of the trainees learned only the Crawler Tractor skills. Over half (63%) learned to operate one additional piece of equipment, and 17% learned to operate two additional pieces of equipment.

Table 4

Comparison of Total Skills Acquired by Trainees in the Self-Paced I and Self-Paced II Programs

Group	1 Skill	1 Skill + Peer Instruction	2 Skills	2 Skills + Peer Instruction	3 Skills	3 Skills + Peer Instruction
Self-Paced I (N=138)	17	--	95	--	26	--
Self-Paced II (N=143)	11	29	47	35	20	1
	40		82		21	
	1 Skill		2 Skills		3 Skills	
Total (N=281)	57 (20%)		177 (63%)		47 (17%)	

LOGISTICAL SUPPORT

Since all engineer equipment at the Engineer Training Center is fueled from a central facility on an as-required basis, no reliable data were available to compare fuel consumption figures under the self-paced programs with consumption figures under the conventional seven-week program for the Crawler Tractor Course. However, it was inferred from the large reductions in individual training time in the self-paced programs (up to four weeks for many) that fuel consumption per student was accordingly reduced. Since the faster learners went on to operate other engineer equipment, the fuel not consumed in the Crawler Tractor Operator Course was available for use in attaining proficiency on the other heavy equipment.

A significant change took place in the requirement for classrooms. Where formerly two 100-man classrooms were required intermittently throughout the course, the self-paced programs reduced needs to only one classroom which was used for three and one-half days per cycle. All other Crawler Tractor Operator instruction was moved to the field practice sites, where occasional brief periods of verbal instruction were conducted utilizing bleachers and field shelters.

The self-paced systems were supported with no increase in the assigned instructor cadre.

DISCUSSION AND INTERPRETATION

PERFORMANCE DATA

The weekly graduation figures for the 21 classes (seven each under Initial Self-Paced I, Refined Self-Paced I, and Self-Paced II) demonstrate that the provision for self-pacing in this course resulted in dramatic reductions in training time for most of the trainees. As the system operated with successive classes, over time there was a shift toward earlier graduation. In the first classes, a small number of trainees were being graduated in the third week and a larger number in the seventh week. In later classes, there were higher graduation rates for the third week than for the seventh week. After the system had operated for a period of time and had "shaken down" (Refined Self-Paced I and Self-Paced II), approximately half of the graduates were finished by the fourth week. Only a few (11-15%) needed the full seven weeks.

Attrition rates seemed to stabilize over time. While the first seven classes showed only one man failing to qualify (.5%), the seven classes in Refined Self-Paced I showed approximately a 5% attrition rate, and the seven classes under Self-Paced II showed a 6% attrition rate. Recycling for administrative or academic reasons was also 5% and 6%, respectively. This is taken to reflect the fact that the cadre acquired a clearer understanding of the Go/No-Go test standards, and found themselves growing more confident with the system. They were less likely to employ the old system of subjective ratings that might incline them toward certifying marginal trainees as being qualified. The system did, indeed, permit trainees to proceed through the course at their own rates of learning. Those who had previous skill experience or possessed the aptitude and motivation to learn quickly were not held back. At the same time, the slower learners had available the necessary time for skill acquisition and practice to reach the required performance standards.

ATTITUDES

Across all 21 classes, trainee attitudes appeared to be positive toward the several aspects of self-pacing. They were motivated to learn, their morale was good, and they responded well to the instructional techniques employed.

Cadre attitudes, however, were initially a mixture of mildly positive and negative reactions toward self-pacing. Apparently cadre personnel were comfortable with the conventional system and departed from it with some trepidation. However, as they gained experience with the system, and as they helped refine it, their attitudes changed. Over time, as they found that time was not being wasted, as they found themselves working less hard than they did at first, and as they saw the system turning out proficient graduates, they came to accept positively the training and administrative changes required by self-pacing and peer instruction.

EFFECTS OF APTITUDE ON PERFORMANCE

As shown by the correlation coefficients in Table 1, the amount of time to reach proficiency had little or no relationship with verbal test predictors (AFQT, ST, and MM)

under the conditions of Self-Paced I, and a moderate relationship under the conditions of Self-Paced II. This is a departure from the findings of numerous prior studies which have typically shown course performance (test grades) to be highly related to these predictors. In the past, under conventional conditions, much of the instruction has been verbal and knowledge-oriented and geared toward paper-and-pencil assessment. Thus, the tests from which these predictor scores are derived, the tests used to assess the outcomes of learning, and the instructional techniques employed all had a large common verbal component. Performance training and testing, however, place much less reliance on the verbal medium and stress practice and "hands-on" skill acquisition. Performance training and testing techniques make it possible for trainees of all aptitudes to acquire the desired levels of skill performance. Under the present techniques, low verbal aptitude trainees were penalized less than under conventional training procedures. Studies have demonstrated[1] that lower aptitude trainees require more time to learn such skills, but that they do learn them.

The correlation coefficients for Self-Paced I and Self-Paced II are corroborated by the data of Tables 2 and 3. Under Self-Paced I conditions, the several aptitude groups were practically identical in their days-to-proficiency scores; under Self-Paced II conditions, the Mental Category IV group was significantly slower than the other groups.

The interpretation of these aptitude differences between the Self-Paced I and Self-Paced II groups, as reflected in both the correlations and days-to-proficiency scores, is not a simple one. These differences probably resulted from a combination of course administration and instructional technique factors acting as follows:

(1) As the system was refined, it came to be more and more self-paced, allowing those who required more practice time to have it.

(2) Self-Paced II encouraged the cadre to provide more attention to each individual and to make sure that each trainee passed all tests for a given module before he was permitted to move on.

(3) Self-Paced II trainees did not have to conform to a weekly testing schedule.

As stated previously, as test standards became clearer to the cadre, and as the cadre became more comfortable with the system, they were less likely to be lenient and less likely to certify the marginal trainees as qualified to be allowed to pass on. Generally, there came to be less pressure on the part of the cadre to push the trainees through the system.

ADDITIONAL SKILLS DATA

The data summarized in Table 4 show that, in addition to making dramatic reductions in training time possible in learning to operate the Crawler Tractor, the system made it possible to train most of the trainees in more than one set of skills. For the combined groups, 63% of the trainees learned to operate the Crawler Tractor and one other piece of heavy equipment, and 17% learned to operate the Crawler Tractor and two other pieces of heavy equipment in the time prescribed for Crawler Tractor under conventional conditions.

[1] Wayne L. Fox, John E. Taylor, and John S. Caylor. *Aptitude Level and the Acquisition of Skills and Knowledges in a Variety of Military Training Tasks*, HumRRO Technical Report 69-6, 54 pp., May 1969.

John E. Taylor, Eugene R. Michaels, and Mark F. Brennan. *The Concepts of Performance-Oriented Instruction Used in Developing the Experimental Volunteer Army Training Program*, HumRRO Technical Report 72-7, 62 pp., March 1972.

SUPPORT

The system operated with no increase in support requirements. Fuel was consumed more efficiently, the need for classroom facilities was reduced, and there was no requirement to increase the number of instructors.

DEMONSTRATED ADVANTAGES OF SELF-PACING

The self-pacing system permits training managers to exercise a new flexibility in their use of training time. Faster learners could be retained in the training base and provided with additional instruction to increase their performance capabilities, or they could be accelerated through the training base, saving the time conventionally required to qualify for entry-level assignment. A discussion of the projections for each of these options, based upon the data of this study, follows.

Projection for Increased Performance

The utilization of self-paced training systems in heavy equipment operator courses of fixed time length opens up the potential for significantly increased skill performance attainment for a sizeable percentage of the trainee output. If a number of equipment operator courses are clustered at a training installation, it is possible, through the use of self-pacing, to have all trainees entering each course qualify at a minimum in their designated or basic operator skill. For those trainees who are the faster learners in each course, it is possible for them, after qualifying in their basic skill, to enter other equipment operator courses in the cluster. If all these equipment operator courses are self-paced, trainees would be permitted to acquire a variable number of additional skills depending upon their rates of learning.

Projecting the data from Table 4 to a 1000-man output from the Crawler Tractor Operator Course, it is possible that for every 1,000 trainees graduated from the course, 17%, or 170, could learn those skills plus two additional sets of operator skills; 63%, or 630, could learn the Crawler Tractor skills plus one additional set of operator skills; the remaining 20%, or 200, could be expected to learn only the Crawler Tractor skills.

Projection for Savings of Training Time

The utilization of self-paced training systems for the training of individuals in equipment operator MOSs also opens up the potential for significant savings of man-days in the training base and for increased utilization of these man-days in unit assignment. It would be possible to send soldiers directly to their units, once they have met the performance standards for entry-level assignment, except for the constraints imposed by Public Law 82-51 and Public Law 88-110.

Combining the weekly performance test data for the seven classes of Refined Self-Paced I and the seven classes for Self-Paced II, and calculating on the basis of a 1000-man input to the course, projected time savings are as follows: If 22% finish at the end of three weeks, there would be a saving of 4,400 man-days of training; if 25% finish at the end of four weeks, there would be an additional saving of 3,750 man-days; if another 30% finish at the end of five weeks, there would be a further saving of 3,000 man-days. Thus, for every 1000-man input, there is a possible 11,150 man-day savings or approximately 32% of the normal 35,000 man-days in a seven-week course. Assuming a cost of $50 per man-day of training, a saving of $557,500 per 1000-man input is possible.

APPENDICES

Appendix A

SELF-PACED II PERFORMANCE TESTS

COMPANY B
4th BATTALION (SP)
4th Advanced Individual Training Brigade (ENGR)
United States Army Training Center Engineer
Fort Leonard Wood, Missouri 65473

STUDENT WORKBOOK

CRAWLER TRACTOR OPERATORS' COURSE

PERFORMANCE TEST NO. 1A
STARTING, OPERATION AND STOPPING PROCEDURES

CRAWLER TRACTOR
D7E or D7F

TEST ORIENTATION: (Tester will read to students) "You are a newly assigned operator of a crawler tractor in an engineer construction unit. You are to demonstrate your proficiency in starting, operating, and stopping the crawler tractor. You are to do this on your own without any notes or coaching."

TEST CONDITION: The test will be conducted outdoors on the equipment.

NECESSARY EQUIPMENT: Crawler Tractors (D7E & D7F)

Test Situation A:
"Start the Engine."

GO	NO GO	GO	NO GO	GO	NO GO

Performance Measures:

1. Apply brakes and lock with brake lock control.
2. Lock speed selector lever in neutral with safety lock.
3. Turn disconnect switch on.
4. Pull governor control lever back until it snaps over detent to open fuel injection pumps.
5. Push in and turn heat-start switch to HEAT position as follows:

above 60 F	NONE
60 F to 32 F	1 min
32 F to 0 F	2 min
below 0 F	3 min

6. Push in and turn heat-start switch to START position. (NOTE: On D7F if starter cuts off press manual override button, on left side of console, and start again.)

CAUTION: Never operate electric starter more than 30 sec at a time. Allow 2 min for cooling before starting again.

7. When engine starts, return heat-start switch to HEAT position (When below 60 F) until engine runs smoothly.

CAUTION: Do not turn heat-start switch to HEAT position while engine is warm and running.

Do not turn disconnect switch off when engine is running.

Turn disconnect switch off if engine is not running.

Test Situation B:

"Raise the blade, tilt it to the right, the left, and then level."

GO	NO GO	GO	NO GO	GO	NO GO

Performance Measures:

1. Raises the blade.
2. Tilts blade to the right.
3. Tilts blade to the left.
4. Levels blade.

Test Situation C:

"Move forward, make two figure eights on the driving course and return to your position."

Performance Measures:

1. Releases brake and lock.
2. Brings engine to desired speed.
3. Moves forward correctly.
4. Turns right correctly.
5. Turns left correctly.
6. Stops correctly.
7. Backs tractor correctly.
8. Decelerates engine speed and halts.
9. Moves speed selector to neutral and locks transmission safety lock.
10. Applies brakes and locks.

GO	NO GO	GO	NO GO	GO	NO GO

11. Places bulldozer control lever in float position.
12. Lowers attachments to ground.

Test Situation D:
"Stop the Engine"

Performance Measures:

1. Idles engine for five(5) minutes with governor control lever at half speed position.
2. Reduces engine speed to low idle and allows engine to run for 30 seconds.
3. Stops engine—moves governor control lever to off position.
4. Turns disconnect switch off.

For all Test Situations: Employs proper safety measures.

TEST STANDARDS: As prescribed in current TMs.

PERFORMANCE TEST NO. 1B
DAILY PREVENTIVE MAINTENANCE SERVICES

CRAWLER TRACTOR
D7E & D7F

TEST ORIENTATION: (Tester will read to student) "You are a newly assigned operator of a crawler tractor in an engineer construction unit. You are to demonstrate your proficiency in before-, during-, and after-operation maintenance procedures. You are to do this on your own without any notes or coaching."

TEST CONDITION: Test will be given outdoors on the equipment.

NECESSARY EQUIPMENT: Crawler Tractor(D7E & D7F), TM 5-2410-214-12 and TM 5-2410-233-10, and appropriate tools.

Test Situation A:
"Show me the before-operation checks on the D7E & D7F."

GO or NOGO	GO or NOGO	GO or NOGO	GO or NOGO	GO or NOGO	GO or NOGO

Performance Measures:

Before Starting Engine

1. Perform Visual Walk-around inspection.
2. Check Radiator, add coolant if needed
   a. On the D7F coolant must be at least one(1) inch from bottom of fill neck.
   b. On the D7E coolant must be above baffle plate.
3. Check fuel supply, add if needed.
4. Check Hydraulic Tank, add if needed.
5. Check Engine Oil, add oil if needed.
   a. On the D7F check the quantity of oil.
   b. On the D7E check for the presence of oil.

After Starting Engine

6. Check Engine Oil, add if needed.
7. Check Transmission, add oil if needed.
8. Check Lights.

Test Situation B:
"Show me the during-operations checks on the D7E & D7F."

Performance Measures:

1. Check Controls.
2. Check Instruments.
   a. Engine water temperature gage.
   b. Ammeter.
   c. Engine oil pressure gage.
   d. Fuel pressure gage.
   e. Torque converter temperature gage.
   f. Transmission oil pressure gage.
3. Air restrictor indicator.

Test Situation C:
"Show me the after-operation checks on the D7E & D7F."

Performance Measures:

1. Check air cleaner and remove dust collector cup (D7E only).
2. Check fuel supply, add if needed.
3. Remove mud and dirt from tracks and carrier rollers.

For All Test Situations:

(1) Employ proper safety measures.
(2) Use proper tools.

TEST STANDARDS: As prescribed by current TMs.

GO or NOGO	GO or NOGO	GO or NOGO	GO or NOGO	GO or NOGO	GO or NOGO

PERFORMANCE TEST NO. 2
CUT AND FILL

TEST SITUATION: (Tester will read to trainee) "You are to demonstrate your proficiency in performing cut and fill operations. You are to construct a road section approximately 50 feet long and 10½ feet wide and 1 foot deep from here (point) to there (point). Go ahead. Let me know when your job is complete. You Have 20 min."

TEST CONDITION: Road section, marked by stakes, on rough, uneven ground.

NECESSARY EQUIPMENT: Crawler Tractor D-7E or D-7F

Performance Measures:

1. Makes cuts in straight line.
2. Makes cuts smooth and even.
3. Fills in low spots and spreads material to be level with cuts.
4. Stockpiles excess dirt to one side.
5. Provides slope for drainage.
6. Demonstrates proper blade control.
7. Applies proper safety measures.

GO	NO GO	GO	NO GO	GO	NO GO

TEST STANDARDS:

Length + or - 3 feet of marked length
Width + or - 3 feet of marked width
Depth + or - 10 inches of required depth

PERFORMANCE TEST NO. 3
DITCH CONSTRUCTION

TEST SITUATION: (Tester will read to trainee) "You are to demonstrate your proficiency in constructing a ditch. Construct a V ditch 50 feet long and 2 feet deep, from here (point) to there (point). Go ahead. Let me know when your job is complete. You have 30 min."

TEST CONDITION: Sloping, Uneven ground.

NECESSARY EQUIPMENT: Crawler Tractor D-7E or D-7F.

Performance Measures:	GO	NO GO	GO	NO GO	GO	NO GO
1. Tilts blade properly.						
2. Makes marking cut approximately 3" - 4" deep.						
3. Marks cut along entire length of the ditch.						
4. Cuts ditch to a minimum of 1½ feet in depth.						
5. Cuts ditch at a slope for drainage.						
6. Smooths sides and straightens bottom.						
7. Stockpiles excess dirt to one side.						
8. Demonstrates proper blade control.						
9. Applies proper safety measures.						

TEST STANDARD: As stated in performance measures.

PERFORMANCE TEST NO. 4

SIDEHILL CUT

TEST SITUATION: (Tester will read to trainee) "You are to demonstrate your proficiency in making a sidehill cut. Prepare a roadway with a safe width (between 10 and 15 feet) for the present soil conditions on the side of the hill from here (point) to there (point). Go ahead. Let me know when your job is finished. You have 30 min."

TEST CONDITION: Hillside, with stakes marking area for road.

NECESSARY EQUIPMENT: Crawler Tractor D7E or D7F.

Performance Measures:	GO	NO GO	GO	NO GO	GO	NO GO
1. Starts cuts from below, working up.						
2. Makes bench large enough to hold crawler tractor.						
3. Turns crawler tractor on to bench; keeps roadway at a safe width.						
4. Slants road into hill.						
5. Pushes excess dirt to outside (downhill) slope.						
6. Demonstrates proper blade control.						
7. Applies proper safety measures, including						
a. Bench is wide enough for both tracks.						
b. Looking behind while backing.						

TEST STANDARDS: As stated in performance measures.

PERFORMANCE TEST NO. 5

RECOVERY OF EQUIPMENT

TEST SITUATION: (Tester will read to trainee) "You are to demonstrate your proficiency in recovering heavy equipment. Using a crawler tractor, pull that piece of equipment (point) to this location (point) with your winch. Go ahead. You have 10 min."

TEST CONDITION: Training area, adequate for conducting recovery operations.

NECESSARY EQUIPMENT: Crawler tractor D-7E or D-7F and any one of the following pieces of equipment:

Crawler tractor
Grader
Wheeled tractor
Scoop loader
1 pr heavy gloves/trainee

Performance Measures:	GO	NO GO	GO	NO GO	GO	NO GO
1. Moves crawler tractor to winching position, offset not more than 5° from a straight winch line.						
2. Wears gloves when handling cable.						
3. Inspects cable for loops and kinks before using.						
4. Hooks cable to vehicle frame (not attachments).						
5. Sets brakes.						
6. Warns others to stay outside circle of safety.						
7. Takes slack up on cable.						
8. Signals operator of other vehicle to start movement.						
9. Stays low behind crawler tractor fuel tank while winching.						
10. Winches vehicle to safety.						
11. Operates winch controls properly.						

TEST STANDARD: As stated in performance measures.

PERFORMANCE TEST NO. 6

SERVICING AIR CLEANER

TEST SITUATION: (Tester reads to trainee) "The air cleaner service indicator is red on that crawler tractor. Service the air cleaner."

TEST CONDITION: Shop or field.

NECESSARY EQUIPMENT: Crawler Tractor D-7E; Appropriate TMs: Necessary tools; Air compressor.

Performance Measures:	GO	NO GO	GO	NO GO	GO	NO GO
1. Remove the dust collector cup and empty the dust.						
2. Inspect the seals for leakage and condition.						
3. Inspect the lower body of the air cleaner element every 10-15 hours to ensure tubes are clean.						
4. Remove filter element every 125-250 hours for inspection and cleaning:						
a. Clean with compressed air from inside-out.						
b. Wash with warm soapy water.						
c. Dry before replacing.						
5. Inspect outer and inner rings of secondary element for breaks.						
6. Insure that element is properly sealed.						
7. Reassemble.						
8. Reset air cleaner service indicator.						

PERFORMANCE TEST NO. 7

SERVICING PRIMARY FUEL FILTER

TEST ORIENTATION: (Tester reads to trainee) "You are to demonstrate your ability to service the fuel filter on a crawler tractor. When the filter is serviced, air will enter the fuel system and the system must be primed."

TEST CONDITION: Shop or field.

NECESSARY EQUIPMENT: Crawler Tractor, D-7E; appropriate TMs: Necessary tools; kerosene, diesel fuel, or solvent.

GO	NO GO	GO	NO GO	GO	NO GO

Test Situation A:
"Service the fuel filter."

Performance Measures:

1. Shut off fuel line valve.
2. Loosen nut on filter cover and lower the case.
3. Remove element and wash in kerosene, diesel fuel or solvent. (Do not use gasoline or water for cleaning.)
4. Clean inside and outside filter case.
5. Check gasket and replace.
6. Install clean element.
7. Assemble filter cover and tighten nut on filter cover.

Test Situation B:
"Prime the fuel system."

Performance Measures:

1. Be sure fuel line valve on bottom of tank is open.
2. Move governor control lever to stop position.
3. Loosen handle of fuel priming pump.

4. Open petcock on top of fuel pump.
5. Operate plunger up and down to provide fuel pressure.
6. Open and close petcock several times to bleed all air from the system.
7. When flow of fuel is continuous and contains no air bubbles, close the petcock.
8. Start engine.
9. Check pressure gage for proper reading.
10. Inspect housing for leaks.

GO	NO GO	GO	NO GO	GO	NO GO

PERFORMANCE TEST NO. 8

TRACK ADJUSTMENT

TEST ORIENTATION: (Tester reads to trainee) "You are to demonstrate your ability to check and correct improper track adjustment on a crawler tractor."

TEST CONDITION: Shop or field.

NECESSARY EQUIPMENT: Crawler tractor; Necessary tools; Appropriate TMs.

GO	NO GO	GO	NO GO	GO	NO GO

Test Situation A:
"Check the sag distance."

Performance Measures:

1. Place a straight edge on the track from the front idler to the front roller.
2. With a ruler, measure the distance from the straight edge to the top of a cleat. It should measure 1 to 1½ inches.

Test Situation B:
"Show me how to adjust a track that is too tight."

Performance Measures:

1. Remove all dirt, sticks or other debris that may prevent retraction of front idler.
2. Turn relief valve 1 turn counter-clockwise and allow grease to escape from vent holes.
3. Tighten relief valve when 1 to 1½ inches of sag has developed.

Test Situation C:

"Show me how to adjust a track that is too loose."

1. Clean the track assembly.
2. Apply lubricant GAA with a grease gun into fill valve fittings until track is at 1 to ½ inches of sag.
3. Operate tractor backward and forward to equalize adjustment.
4. Recheck the adjustment.

GO	NO GO	GO	NO GO	GO	NO GO

PERFORMANCE TEST NO. 9

10 HOUR LUBRICATION

TEST SITUATION: (Tester reads to trainee) "Perform a 10 hour lubrication service on that crawler tractor (point)."

TEST CONDITION: Shop or field.

NECESSARY EQUIPMENT: Crawler tractor D-7E or D-7F; Appropriate TMs; Appropriate LOs; Tools and lube equipment.

Performance Measures:

1. Selects proper TM and LO for tractor.
2. Before servicing, wipes all lube points free of dirt and grease.
3. Services 10 hour lube points according to TM and LO.
4. Cleans excess grease from lube points after servicing.
5. Uses correct tools.
6. Applies safety measures.

GO	NO GO	GO	NO GO	GO	NO GO

PERFORMANCE TEST NO. 10
MAINTENANCE FORMS

TEST ORIENTATION: (Tester reads to trainee) "You are to demonstrate your ability to complete maintenance forms 2400 and 2404 on the crawler tractor. I will give you the necessary information."

TEST CONDITION: Shop or field.

NECESSARY EQUIPMENT: Maintenance Forms 2400 and 2404; Appropriate TMs.

Test Situation A:
"Prepare an Equipment Utilization Record, Form 2400." (Tester provides information for trainee to fill out form. Trainee must use a blank form 2400, making each entry in the correct place.)

(See Form 2400, attached)

Test Situation B:
"Prepare an Equipment Inspection and Maintenance Worksheet, Form 2404." (Tester provides information for trainee to fill out form. Trainee must use a blank form 2404 making each entry in the correct place.)

(See Form 2404, attached)

EQUIPMENT UTILIZATION RECORD

For use of this form, see TM 38-750; the proponent agency is Office of Deputy Chief of Staff for Logistics.

DATE (1)	TYPE (2)	USA NUMBER/SERIAL NUMBER (3)	ADMINISTRATION NUMBER (4)
1 JAN 74	TRACTOR, CRAWLER D7E	08A3139	A-279

ORGANIZATION (5)	ACTION	TIME	MILES	HOURS	
Co B,4th Bn(SP),4th AIT Bde					
1ST OPERATOR (6) JOHN A. DOE	IN	1730 (17)		529 (18)	REPORT TO
OPERATOR'S SIGNATURE (7) John A. Doe	OUT	0730 (8)		520 (9)	DISPATCHER'S SIGNATURE
	TOTAL	1000 (19)		9 (20)	
2ND OPERATOR	IN				REPORT TO
OPERATOR'S SIGNATURE	OUT				DISPATCHER'S SIGNATURE
	TOTAL				
3RD OPERATOR	IN				REPORT TO
OPERATOR'S SIGNATURE	OUT				DISPATCHER'S SIGNATURE
	TOTAL				
4TH OPERATOR	IN				REPORT TO
OPERATOR'S SIGNATURE	OUT				DISPATCHER'S SIGNATURE
	TOTAL				

DESTINATION	TIME ARRIVE	TIME DEPART	RELEASED BY (Signature)	REMARKS
FROM a. PARK LINE (10)		0730 (11)		
TO a. WORK SITES (12)	0800 (13)	1700 (14)		
TO a. PARK LINE (15)	1730 (16)			

#	GO	NO GO	GO	NO GO	GO	NO GO	#	GO	NO GO	GO	NO GO	GO	NO GO
1							11						
2							12						
3							13						
4							14						
5							15						
6							16						
7							17						
8							18						
9							19						
10							20						

DA FORM 1 JAN 64 2400

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics.

1. ORGANIZATION (1)	2. NOMENCLATURE AND MODEL (2)
CO B, 4TH BN(SP), 4TH AIT BDE(ENGR)	TRACTOR, CRAWLER D7F

3. REGISTRATION/SERIAL/FSN (3)	4a. MILES	4b. HOURS (4)	4c. ROUNDS FIRED	4d. HOT STARTS	5. DATE (5)	6. TYPE INSPECTION (6)
08A2791		247			4 JAN '74	DAILY

7. APPLICABLE REFERENCE

TM NUMBER (7)	TM DATE (8)	TM NUMBER	TM DATE
TM 5-2410-233-10	NOV '72		

INSTRUCTIONS - Perform each check listed in the TM applicable to the inspection performed. Following the sequence listed in pertinent TM, complete form as follows:

COLUMN a - Enter TM item number.

COLUMN b - Enter the applicable condition status symbol.

COLUMN c - Enter deficiencies and shortcomings.

COLUMN d - Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e - Individual ascertaining completed corrective action initial in this column.

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

9a. SIGNATURE (Person(s) performing inspection) (9)	9b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED
John A Doe				

TM ITEM NO. a (10)	STATUS b (11)	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
		1 JAN '74 (12)	(13)	JAD (14)
		2 JAN '74		JAD
		3 JAN '74		JAD
3-1	X	LIGHTS INOPERABLE		
3-1	/	OPERATOR SEAT TORN		

#	GO	NO GO	GO	NO GO	GO	NO GO	#	GO	NO GO	GO	NO GO	GO	NO GO
1							8						
2							9						
3							10						
4							11						
5							12						
6							13						
7							14						

Appendix B

QUESTIONNAIRES USED TO SAMPLE TRAINEE AND INSTRUCTOR ATTITUDES TOWARD THE SELF-PACED PROGRAMS

Crawler Tractor Operators Course

Student Survey

Name _____
Last First MI

Social Security No. _____

Class No. _____

Check one answer for each question which is closest to the way you feel about the course.

1. How do you like learning to operate construction equipment?
   - _____ Excellent
   - _____ Good
   - _____ Average
   - _____ Fair
   - _____ Poor

2. Do you think what you learned will help you in your next Army assignment?
   - _____ Quite a lot
   - _____ Some
   - _____ About average
   - _____ Not much
   - _____ Very little

3. Where did you get the most help in learning to operate the equipment?
   - _____ My buddy
   - _____ Another (more advanced) student
   - _____ The Assistant Instructors
   - _____ The NCO in charge
   - _____ Got no help

4. How hard did you find the performance tests?
   - _____ Very hard
   - _____ Somewhat hard
   - _____ Average
   - _____ Easy
   - _____ Too easy

5. Are the things you have to do in the performance tests about what you think you would have to do on the job?
   - _____ Definitely
   - _____ Somewhat
   - _____ Average
   - _____ Not quite
   - _____ Not at all

6. Were you allowed to take a performance test when you were ready?
   - _____ Always
   - _____ Almost always
   - _____ Average
   - _____ Seldom
   - _____ Never

7. Were the performance tests complete checks on what you were taught?
   - _____ Very complete
   - _____ Somewhat complete
   - _____ Average
   - _____ Very poor
   - _____ Incomplete

8. Were you allowed to go through the crawler tractor course as fast as you could learn?
   _____ Always
   _____ Almost always
   _____ Average
   _____ Seldom
   _____ Never

9. Do you feel other students were allowed to go through the crawler tractor course as fast as they could learn?
   _____ Always
   _____ Almost always
   _____ Average
   _____ Seldom
   _____ Never

10. Did you get a chance to help another student and tell him what he was doing right or wrong?
   _____ All the time
   _____ Quite often
   _____ Usually
   _____ Seldom
   _____ Never

11. How often do students move ahead by themselves rather than as a group?
   _____ Always
   _____ Almost always
   _____ Average
   _____ Seldom
   _____ Never

12. Is the student who needs more time to learn given the additional time to get ready for the performance tests?
   _____ Always
   _____ Almost always
   _____ Average
   _____ Seldom
   _____ Never

HumRRO Instructor Information Questionnaire

Please Print Date _____

Name _____ Rank _____ Unit _____

SSN _____ Years of service _____

Primary MOS _____ Years in Primary MOS _____

Secondary MOS _____ Years in Secondary MOS _____

Present job _____ How long? _____

Age _____ Years of Schooling _____

Are you a qualified Crawler Tractor Operator? YES _____ NO _____

Where did you learn to be a Crawler Tractor Operator? In a CTOC _____
OJT _____

As an NCO in an Engineer unit have you supervised crawler tractor operators working on a job? YES _____ NO _____

In the following statements, please check the one answer which is closest to the way you feel or is closest to the correct information.

1. How does the Incentive Program compare with the Older Program as far as the amount of material students actually learn?

   _____ Students learn much more in the Incentive Program
   _____ Students learn a little more in the Incentive Program
   _____ Students learn about the same amount in both programs
   _____ Students learn a little less in the Incentive Program
   _____ Students learn much less in the Incentive Program

2. How does the Incentive Program compare with the Older Program as far as motivation and morale of students?

   _____ Student motivation and morale are much higher in the Incentive Program
   _____ Student motivation and morale are a little higher in the Incentive Program
   _____ Student motivation and morale are about the same in both programs
   _____ Student motivation and morale are a little lower in the Incentive Program
   _____ Student motivation and morale are much lower in the Incentive Program

3. How does the Incentive Program compare with the Older Program as far as work load of the NCOs?

   _____ The NCOs work load is much heavier in the Incentive Program
   _____ The NCOs work load is a little heavier in the Incentive Program
   _____ The NCOs work loads are about the same in both programs
   _____ The NCOs work load is a little lighter in the Incentive Program
   _____ The NCOs work load is much lighter in the Incentive Program

4. How does the Incentive Program compare with the Older Program as far as the motivation and morale of NCOs?

   _____ NCO's motivation and morale are much higher in the Incentive Program
   _____ NCO's motivation and morale are a little higher in the Incentive Program
   _____ NCO's motivation and morale are about the same in both programs
   _____ NCO's motivation and morale are a little lower in the Incentive Program
   _____ NCO's motivation and morale are much lower in the Incentive Program

5. How does the Incentive Program compare with the Older Program as far as the amount of time that is wasted?

   _____ Far more time is wasted in the Incentive Program
   _____ A little more time is wasted in the Incentive Program
   _____ About the same amount of time is wasted in both programs
   _____ A little less time is wasted in the Incentive Program
   _____ Far less time is wasted in the Incentive Program

6. How does the Incentive Program compare with the Older Program as far as the efficient use of equipment and other resources?

   _____ The Incentive Program is far more efficient
   _____ The Incentive Program is a little more efficient
   _____ They are about equally efficient
   _____ The Incentive Program is a little less efficient
   _____ The Incentive Program is far less efficient

7. If I were in an Engineer unit in the field, I would be happy to have any CTOC graduate assigned to my platoon.

_____ Agree completely
_____ Agree moderately
_____ Undecided
_____ Disagree moderately
_____ Disagree completely

8. Most of what is taught in the CTOC is need-to-know information.

_____ Agree completely
_____ Agree moderately
_____ Undecided
_____ Disagree moderately
_____ Disagree completely

9. Once a trainee has passed a test, he should be used to help another trainee who is having trouble.

_____ Agree completely
_____ Agree moderately
_____ Undecided
_____ Disagree moderately
_____ Disagree completely

10. Trainees could get a lot out of helping each other to learn.

_____ Agree completely
_____ Agree moderately
_____ Undecided
_____ Disagree moderately
_____ Disagree completely

11. Trainees should not be allowed to go on and learn a new skill in the course until they have mastered the one they are working on.

_____ Agree completely
_____ Agree moderately
_____ Undecided
_____ Disagree moderately
_____ Disagree completely

12. The standard for passing tests are too high and should be lowered so that more trainees can qualify.

_____ Agree completely
_____ Agree moderately
_____ Undecided
_____ Disagree moderately
_____ Disagree completely

Date _____

HumRRO

Name _____ Rank _____ ASSN _____

In the following statements, please check the one answer which is closest to the way you feel or closest to the correct information.

1. How does the Self Paced Program compare with the Incentive Program as far as what the students actually learn to do?

   _____ Students learn to do much more in the Self Paced Program
   _____ Students learn to do a little more in the Self Paced Program
   _____ Students learn to do about the same in both programs
   _____ Students learn to do a little less in the Self Paced Program
   _____ Students learn to do much less in the Self Paced Program

2. How does the Self Paced Program compare with the Incentive Program as far as motivation and morale of students?

   _____ Student motivation and morale are much higher in the Self Paced Program
   _____ Student motivation and morale are a little higher in the Self Paced Program
   _____ Student motivation and morale are about the same in both programs
   _____ Student motivation and morale are a little less in the Self Paced Program
   _____ Student motivation and morale are much less in the Self Paced Program

3. How does the Self Paced Program compare with the Incentive Program as far as work load of the NCOs?

   _____ The NCOs work load is much heavier in the Self Paced Program
   _____ The NCOs work load is a little heavier in the Self Paced Program
   _____ The NCOs work load is about the same in both programs
   _____ The NCOs work load is a little lighter in the Self Paced Program
   _____ The NCOs work load is much lighter in the Self Paced Program

4. How does the Self Paced Program compare with the Incentive Program as far as the motivation and morale of NCOs?

   _____ NCO motivation and morale are much higher in the Self Paced Program
   _____ NCO motivation and morale are a little higher in the Self Paced Program
   _____ NCO motivation and morale are about the same in both programs
   _____ NCO motivation and morale are a little lower in the Self Paced Program
   _____ NCO motivation and morale are much lower in the Self Paced Program

5. How does the Self Paced Program compare with the Incentive Program as far as the amount of time that is wasted?

   _____ Far more time is wasted in the Self Paced Program
   _____ A little more time is wasted in the Self Paced Program
   _____ About the same amount of time is wasted in both programs
   _____ A little less time is wasted in the Self Paced Program
   _____ Far less time is wasted in the Self Paced Program

6. How does the Self Paced Program compare with the Incentive Program as far as efficient use of equipment and other resources?

_____ The Self Paced Program is far more efficient
_____ The Self Paced Program is a little more efficient
_____ They are about equally efficient
_____ The Self Paced Program is a little less efficient
_____ The Self Paced Program is far less efficient

7. If I were in an Engineer unit in the field, I would be happy to have a CTOC graduate assigned to my platoon.

_____ Agree completely
_____ Agree moderately
_____ Undecided
_____ Disagree moderately
_____ Disagree completely

8. Most of what is taught in the CTOC is need-to-know information.

_____ Agree completely
_____ Agree moderately
_____ Undecided
_____ Disagree moderately
_____ Disagree completely

9. Once a trainee has passed a test, he should be used to help another trainee who is having trouble.

_____ Agree completely
_____ Agree moderately
_____ Undecided
_____ Disagree moderately
_____ Disagree completely

10. Trainees could get a lot out of helping each other to learn.

_____ Agree completely
_____ Agree moderately
_____ Undecided
_____ Disagree moderately
_____ Disagree completely

11. Trainees should not be allowed to go on and learn a new skill in the course until they have mastered the one they are working on.

_____ Agree completely
_____ Agree moderately
_____ Undecided
_____ Disagree moderately
_____ Disagree completely

12. The standards for passing tests are too high and should be lowered so that more trainees can qualify.

_____ Agree completely
_____ Agree moderately
_____ Undecided
_____ Disagree moderately
_____ Disagree completely